

# ECVCP Examination 2015

## Sample Questions

A. Giordano, C. Trumel, A. Geffré

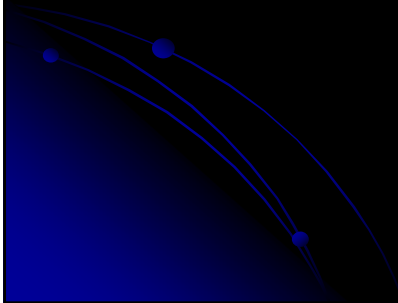
## Agenda: Saturday morning Haematology

MCQ= multiple choice questions  
PIQ= projected image questions  
GS= glass slides

08:00-08:30	(30mn)	Introduction	
08:30-09:30	(1h)	Part 1 = 40 MCQ	20%
09:30-09:45	(15mn)	Break	
09:45-10:15	(30mn)	Part 2 = 20 PIQ	20%
10:15-10:30	(15mn)	Break	
10:30-12:30	(2h)	Part 3 = 10 GS	60%
12:30-13:30	(1h)	Lunch	

# Haematology

Part 1 = 40 multiple choice questions



*ECVCP Examination 2015  
Section of Haematology – part 1: Multiple choice question*

Candidate number: \_\_\_\_\_

## European College of Veterinary Clinical Pathology 2015

### Haematology Examination Part 1: 40 multiple choice questions (MCQ)

#### INSTRUCTIONS FOR PART 1:

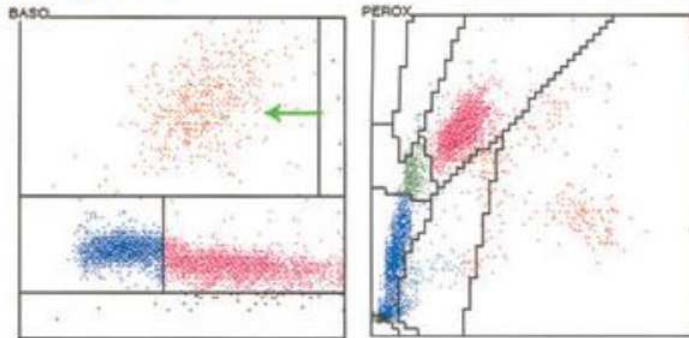
1. Place your candidate number, but not your name on this cover sheet and on each page.
2. For each of the multiple choice questions select one appropriate answer and clearly mark it. All questions for which more than one answer or no answer is marked will be recorded as incorrect. Be certain that any corrections are erased completely.
3. The total time allowed for this section is 1 hour.
4. 0.50 point will be assigned to each correct answer (total points for this part: 20 points). Incorrect answers will receive 0 point.
5. If you have a question during the examination, please raise your hand and an examination committee member will come to you.
6. An English-Another language dictionary may be used by candidates.

## MCQ 7

ECVCP Examination 2015  
Section of Haematology – part 1: Multiple choice question

Scattergrams of the ADVIA 2120 hematology analyzer regarding a blood sample from a rabbit. Which is the interpretation of the cells represented by the orange cluster (indicated by the arrow) into the BASO channel?

See the figure below:



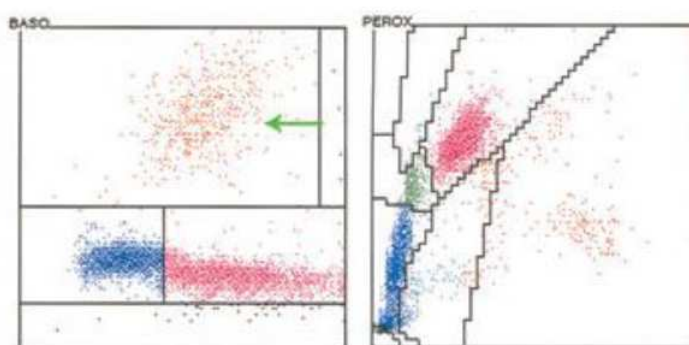
- A. Basophils
- B. Ghost cells
- C. Leukemic cells
- D. Platelet clumps

## MCQ 7

ECVCP Examination 2015  
Section of Haematology – part 1: Multiple choice question

Scattergrams of the ADVIA 2120 hematology analyzer regarding a blood sample from a rabbit. Which is the interpretation of the cells represented by the orange cluster (indicated by the arrow) into the BASO channel?

See the figure below:



- A. Basophils
- B. Ghost cells
- C. Leukemic cells
- D. Platelet clumps

Reference: Errors in basophil enumeration with 3 veterinary hematology systems and observations on occurrence of basophils in dogs. Lilliehöök I, Tvedten HW. Vet Clin Pathol. 2011 Dec;40(4):450-8

### MCQ 9

Which of the following statement is **TRUE** regarding the differences in hematological variables in Wistar rats?

- A. Females rats have a higher WBC count compared with male rats
- B. Males rats have a higher neutrophil count compared with females
- C. Reference limits for WBC are not influenced by the breeding factory
- D. Older Wistar rats have a lower WBC count compared with younger rats

### MCQ 9

Which of the following statement is **TRUE** regarding the differences in hematological variables in Wistar rats?

- A. Females rats have a higher WBC count compared with male rats
- B. Males rats have a higher neutrophil count compared with females
- C. Reference limits for WBC are not influenced by the breeding factory
- D. Older Wistar rats have a lower WBC count compared with younger rats

**Reference:** Differences in hematologic variables in rats of the same strain but different origin. Kampfmann I, Bauer N, Johannes S, Moritz A. Vet Clin Pathol. 2012 Jun;41(2):228-34

**MCQ 35**

**In feline neonatal isoerythrolysis a queen with the AB blood group:**

- A. Should only be mated with B tomcats
- B. Can be mated without concern for the tomcat's blood group
- C. Should not be mated with a B tomcat, due to risk of hemolysis in neonates
- D. Should not be mated with an A tomcat, due to risk of hemolysis in neonates

**MCQ 35**

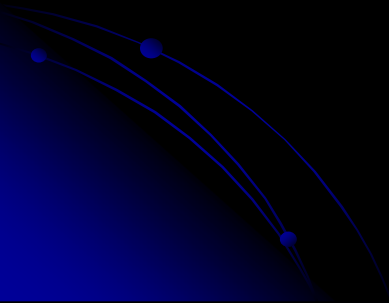
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Reference Stockham p.180

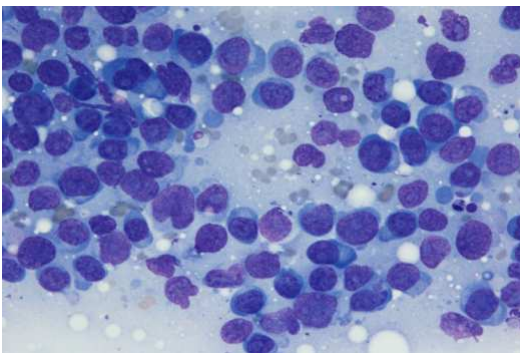
# Haematology

Part 2 = 20 projected image questions



## Case 9 (2.75 points)

- Laboratory mouse, bone marrow smear



### Question 14 (1.75 pts):

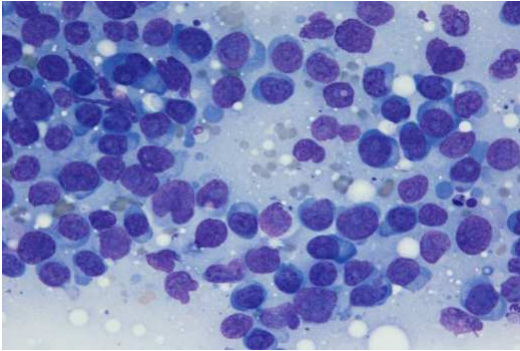
Describe the main population observed on this bone marrow

### Question 15 (1 pt):

Give two differential diagnoses

## Case 9 (2.75 points)

- Laboratory mouse, bone marrow smear



### Question 14 (1.75 pts):

Describe the main population observed on this bone marrow

- A: Many round (0.25 point) and monomorphic blastic cells (0.25 point)  
 -Hyperbasophilia of the cytoplasm (0.25 point), arotoplasm (0.25 point)  
 -Round nucleus (0.25 point) with sometimes a large nucleolus (0.25 point)  
 -Occasional binucleation (0.25 point)

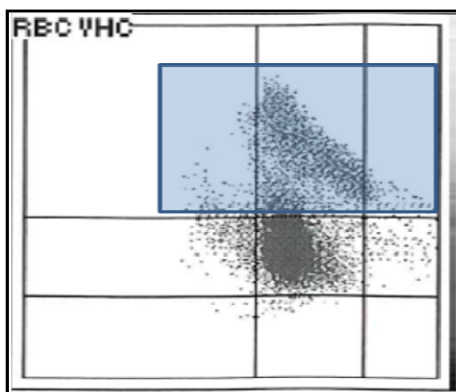
### Question 15 (1 pt):

Give two differential diagnoses

- A: Hematopoietic/Lymphoid malignant neoplasm (0.5 point),  
 - Multiple myeloma (0.5 point)

## Case 12 (1 point)

- A dog with non-regenerative anemia.



### Question 19 (0.5 point):

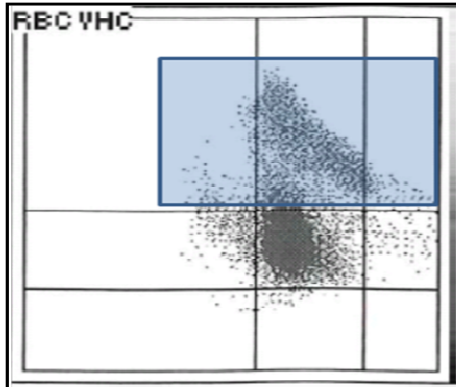
In the depicted ADVIA 120 RBC dot plot, what is the population highlighted by the blue box?

### Question 20 (0.5 point):

Name a confirmatory test for your assumption!

## Case 12 (1 point)

- A dog with non-regenerative anemia.



### Question 19 (0.5 point):

In the depicted ADVIA 120 RBC dot plot, what is the population highlighted by the blue box?

RBC agglutinates / agglutination

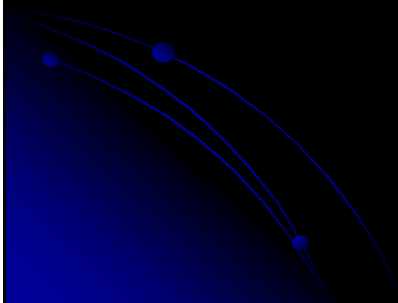
### Question 20 (0.5 point):

Name a confirmatory test for your assumption!

A: Coombs Test/Flow cytometric detection of Anti RBC antibodies

## Haematology

Part 3 = 10 glass slides





Candidate number: \_\_\_\_\_

**HGS 1 (7.875 points)**

**History:** Cat, DSH, male, 10 year-old, with anorexia and intestinal mass

**Hematology results:**

WBC:  $27.76 \times 10^3$  /uL (RI 4-19)

RBC:  $1.97 \times 10^6$  /uL (RI 7-11)

HGB: 3.3 g/dL (RI 10-17)

HCT: 12.6% (RI 29-48)

PLT:  $116 \times 10^3$  /uL (RI 80-450)

**Specimen:** Blood smear (May-Grtünwald-Giemsa stain)

**(WA1)**

**Blood smear description:**

RBC: density is reduced (0.25), with some rouleaux (0.25) and rare NRBC (0.125). Slight polychromasia and anisocytosis (0.25).

WBC: WBC appear moderately increased (0.25), with a prevalence of segmented neutrophils (0.25); rare band neutrophils (0.25). Increased eosinophils (0.25) and basophils (0.25). Lymphocytes appear slightly reduced (0.25). Monocytes normal to reactive. Some (1-2%) large (> 3-5 RBC) round cells (0.25) with moderate amount of cytoplasm filled with several metachromatic-basophilic homogeneous small granules (0.25). Round to oval eccentric nucleus with fine chromatin and inconspicuous nucleoli (0.25). These cells show anisocytosis, anisokaryosis and variable N/C ratio (0.25). Most likely consistent with mast cell (poorly differentiated) (0.25). Least likely differential: LGL lymphocytes (0.25).

Platelet: adequate in number (0.25) with several macroplatelets (0.25). some platelet clumps.

**Interpretation:**

Marked non- or hyporegenerative (0.25) anemia (0.25), with leukocytosis (0.25) due to mature neutrophilia (0.25), eosinophilia (0.25) and basophilia (0.25). Presence of neoplastic circulating cells of mast cell origin (mastocytemia) (0.5) (fraction points if LGL included).

**Comment and suggestions:**

Non- or hyporegenerative anemia could be attributable to several mechanisms: chronic disease, inflammation, chronic blood loss or due to bone marrow infiltration (0.25). Neutrophilia could be due to inflammation or tumor associated (paraneoplastic) (0.25). Basophilia and especially eosinophilia are usually associated with both mast cell tumors and LGL lymphoma (0.25). The pleomorphic population of granulated cells is consistent with a blood invasion from neoplastic cells originating from a hematopoietic tumor (spleen, bone marrow...) (0.25).

Suggestions: immunophenotyping if possible to definitely identify the circulating cells (CD3, CD4, CD8, CD21, CD79a : lymphoid markers) (0.25). Bone marrow aspirate and FNA of lymph nodes, spleen, intestinal mass and other abdominal organs if involved (0.25).

**Total point:** 7.875

## Agenda: Saturday afternoon

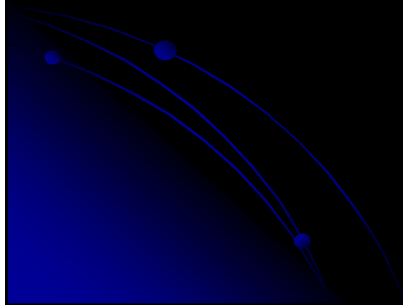
### General clinical pathology

MCQ= multiple choice questions  
SA = Short answer essay

13:30-15:00	(90mn)	Part 1 = 60 MCQ	50%
15:00-15:20	(20mn)	Break	
15:20-16:40	(80mn)	Part 2 = 4 SA	50%

# General clinical pathology

Part 1 = 60 multiple choice questions



ECVCP Examination 2015

Section of General Clinical Pathology – part 1: Multiple choice questions

## MCQ no. 6

Which of the following statements regarding immune response is **FALSE**?

- A.  $T_H2$  subset of  $CD4^+$  T-cells are induced by  $IFN\gamma$  and IL-12
- B. Natural killer cells express CD16 and CD56 on their surface
- C.  $T_H2$  stimulates B cells to differentiate into IgE-secreting plasma cells
- D. Class II MHC molecules are expressed on cells that present ingested antigen and respond to T-cell help

**MCQ no. 6**

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- C. T<sub>H</sub>2 stimulates B cells to differentiate into IgE-secreting plasma cells
- D. Class II MHC molecules are expressed on cells that present ingested antigen and respond to T-cell help

Ref :Robbins p186, p188, p190, p195 / McGavin p246-247, p252-253, p255-256

**MCQ no. 20**

Which combination of the following statements is **TRUE** concerning calcium metabolism in rabbits?

1. Calcium uptake is proportional to the dietary content of calcium
  2. Renal excretion of calcium is critical for calcium homeostasis
  3. Serum total calcium concentrations are typically higher than in other domestic mammals
  4. Vitamin D dependent uptake from the gut is the main mechanisms of absorption
- A. 1, 2, 3
  - B. 1, 2, 4
  - C. 1, 3, 4
  - D. 2, 3, 4

**MCQ no. 20**

Which combination of the following statements is **TRUE** concerning calcium metabolism in rabbits?

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- A. 1, 2, 3  
 B. 1, 2, 4  
 C. 1, 3, 4  
 D. 2, 3, 4

Ref: VCNA EAP 16:1 P 150

**MCQ no. 49**

Which of the following statements regarding reference intervals and their purpose is **FALSE**?

- A. A reference individual is an animal selected by using defined criteria.
- B. A reference interval is an interval between and including the two reference limits.
- C. A reference sample group is a group of specimens collected from reference individuals.
- D. A reference value is a value obtained by measurement of a particular substance in a reference individual.

**MCQ no. 49**

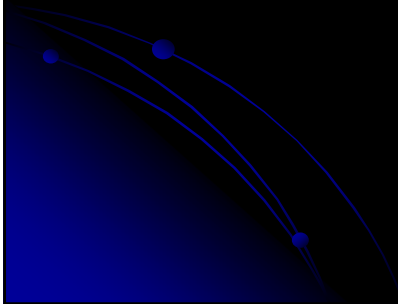
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- C. A reference sample group is a group of specimens collected from reference individuals.
- D. A reference value is a value obtained by measurement of a particular substance in a reference individual.

Ref: Stockham p16

## General clinical pathology

Part 2 = 4 short essay questions



*ECVCP Examination 2015*  
*Section of General Clinical Pathology – part 2: Short answer essay questions*

Candidate number: \_\_\_\_\_

**SAQ 2 (12 points)**

A dog has severe acute pancreatitis with systemic inflammation, metabolic alkalosis and respiratory alkalosis.

Describe the expected clinicopathological changes in the blood of this dog, including the patho-physiological mechanisms behind the changes, for the following:

- 1) Enzyme activities (2 points)
- 2) Glucose and lipid concentration (3 points)
- 3) Protein concentration (3 points)
- 4) Acid base status (2 points)

Answer:

1) Increase in pancreatic enzymes (0.25 p) amylase, lipase, pancreatic lipase immunoreactivity, and trypsin like immunoreactivity (0.25 for each mentioned, max 0.75 p)  
 Mechanism: Leakage from damaged pancreatic acinar cells (0.5 p)  
*Stockham pages 664, 667, 668 and 743.*

Possibly increased activity of liver enzymes (0.25).

Mechanism: Increased release of enzymes from damaged cells (eg ALAT) / increased production (eg ALP) (0.25 p if one mechanism is described).

2) Hyperglycemia (0.5 p)

Mechanisms:

- Physiologic hyperglycemia (0.25 p). Catecholamines stimulate glycogenolysis/promote GH release. (0.25 p). Glucocorticoids stimulate gluconeogenesis (0.25 p) and create a state of insulin resistance (0.25 p). *Stockham page 714.*
- Pancreatitis damaging enough beta-cells to cause pancreatic diabetes mellitus (0.5 p). *Stockham page 716.*

Hypertriglyceridemia (0.5) and (possibly) hypercholesterolemia (0.25 p). Also secondary hyperlipoproteinemia is an accepted answer.

Mechanism: Pathogenesis not firmly established but appears to be a defect in intravascular processing of chylomicrons and VLDL molecules (0.25 p).  
*Stockham page 775.*

3) Increased albumin and globulins (0.5).

Mechanism: Hemoconcentration because of dehydration (vomiting) (0.5 p). *Stockham page 390.*

Albumin could also be decreased, see below.

Increased concentrations of positive acute phase proteins (0.25 p) such as CRP, SAA, haptoglobin, fibrinogen etc (0.25 for each mentioned, max 0.75p). *Stockham page 372 and 398.*

Hemoconcentration and inflammation could cause minor increase in fibrinogen (0.25 p).  
*Stockham page 394 and 395.*

*ECVCP Examination 2015*  
*Section of General Clinical Pathology – part 2: Short answer essay questions*

Fibrinogen could also be decreased because of increased consumption in for example DIC (0.25 p). *Stockham page 396.*

Decreased concentrations of negative acute phase proteins (0.25 p) such as albumin, transferrin (0.25 for each mentioned, max 0.5). *Stockham page 372*

4) Increased  $\text{HCO}_3^-$  because of metabolic alkalosis (0.25).

Mechanism: (0.25) vomiting results in decreased resorption of  $\text{H}^+$  in the intestine and thus does not combine with the  $\text{HCO}_3^-$  produced by the gastric mucosa; that accumulates in plasma (0.25) *Stockham page 576.*

Decreased  $\text{pCO}_2$  because of respiratory alkalosis (0.25).

Mechanism: Hyperventilation (for example due to pain) will remove  $\text{CO}_2$  (0.25) and thus  $\text{H}^+$  at rate faster than  $\text{H}^+$  is being produced (0.25) *Stockham page 577.*

Alkalemia/increased pH (0.25). Mechanism: Concurrent met alkalosis and resp alkalosis will decrease  $\text{H}^+$  concentration and result in increased pH (0.25) *Stockham page 578.*

## Agenda: Sunday morning

### Cytology

MCQ= multiple choice questions  
PIQ= projected image questions  
GS= glass slides

08:20-09:00	(40mn)	Part 1 = 25 MCQ	20%
09:00-09:15	(15mn)	Break	
09:15-09:45	(30mn)	Part 2 = 25 PIQ	20%
09:45-10:00	(15mn)	Break	
10:00-13:00	(3h)	Part 3 = 15 GS	60%
13:00-14:00	(1h)	Lunch	

### Cytology

Part 1 = 25 multiple choice questions

*ECVCP Examination 2015*  
*Section of Cytology – Part 1: Multiple Choice Questions*

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**MCQ no. 1:**

Charcot-Leyden crystals can occasionally be found in cytological samples of some species when collected from tissue affected by:

- A. Extensive collagenolysis
- B. Eosinophilic inflammation
- C. Severe purulent inflammation
- D. Diffuse mineralization processes

*ECVCP Examination 2015*  
*Section of Cytology – Part 1: Multiple Choice Questions*

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- A. Extensive collagenolysis
- B. Eosinophilic inflammation
- C. Severe purulent inflammation
- D. Diffuse mineralization processes

Reference: Cowell and Tyler, Diagnostic cytology and haematology of the dog and cat, 4<sup>th</sup> Ed, p277-279 (Fig 16.16)



*ECVCP Examination 2015*  
*Section of Cytology – Part 1: Multiple Choice Questions*

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**MCQ no. 4**

Regarding cylinduria, all of the following statements are correct, **EXCEPT**:

- A. Waxy casts indicate chronic tubular injury
- B. The presence of hemoglobin casts suggests intra-renal haemorrhage
- C. Numerous fatty casts in feline urine suggests renal tubule degeneration
- D. 0-2 granular casts per x10 objective can be seen in moderately concentrated urine from animals without renal disease

*ECVCP Examination 2015*  
*Section of Cytology – Part 1: Multiple Choice Questions*

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**MCQ no. 4**

Regarding cylinduria, all of the following statements are **CORRECT** except:

- A. Waxy casts indicate chronic tubular injury
- B. The presence of hemoglobin casts suggests intra-renal haemorrhage
- C. Numerous fatty casts in feline urine suggests renal tubule degeneration
- D. 0-2 granular casts per x10 objective can be seen in moderately concentrated urine from animals without renal disease

Reference: Cowell and Tyler, Diagnostic cytology and haematology of the dog and cat, 4<sup>th</sup> Ed, p 421-422

*ECVCP Examination 2015*  
*Section of Cytology – Part 1: Multiple Choice Questions*

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**MCQ no. 14:**

**Bronchoalveolar lavage cytology in equine recurrent airway obstruction is most often characterised by which combination of the following (select one of the options A-D below):**

1. A mixed population of neutrophils and macrophages
2. Squamous metaplasia of the respiratory epithelium
3. Increased numbers of goblet cells
4. Haemorrhage

- A. 1, 2
- B. 1, 2, 3
- C. 2, 3
- D. 2, 3, 4

*ECVCP Examination 2015*  
*Section of Cytology – Part 1: Multiple Choice Questions*

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3. Increased numbers of goblet cells
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- B. 1, 2, 3
- C. 2, 3
- D. 2, 3, 4

Reference: Cowell and Tyler 2nd Ed p 82

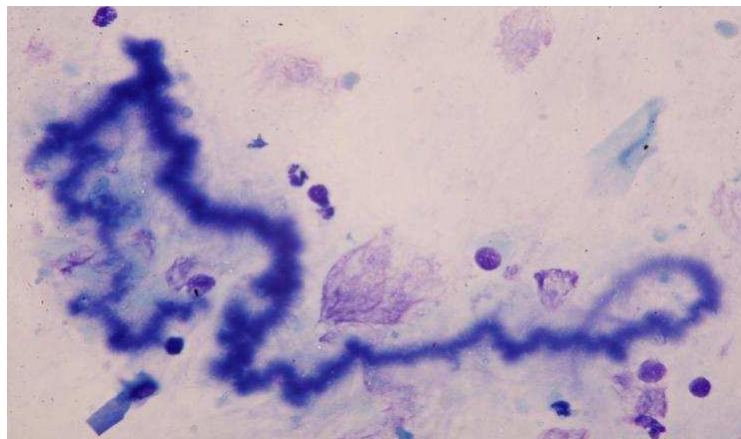
# Cytology

Part 2 = 25 projected image questions

**1 - Dog, chronic cough. BAL (2 points)**

**1. What is this structure called?**

**2. What is it composed of?**



**1 - Dog, chronic cough. BAL (2 points)**

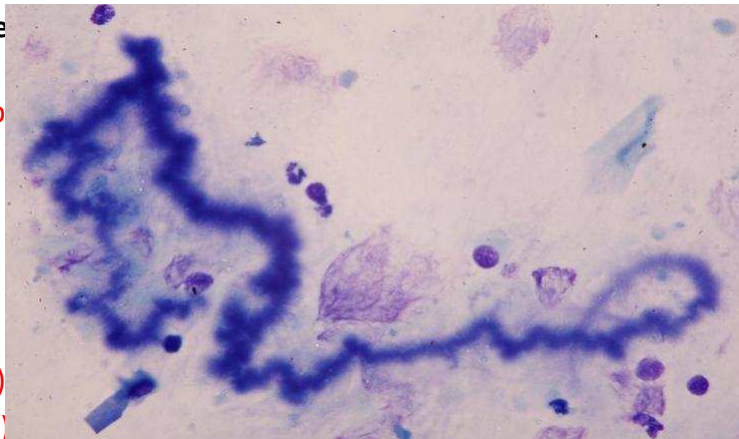
**1. What is this structure called?**

Curschmann's spiral (1 p)

**2. What is it composed of?**

Inspissated mucus (1 pt)

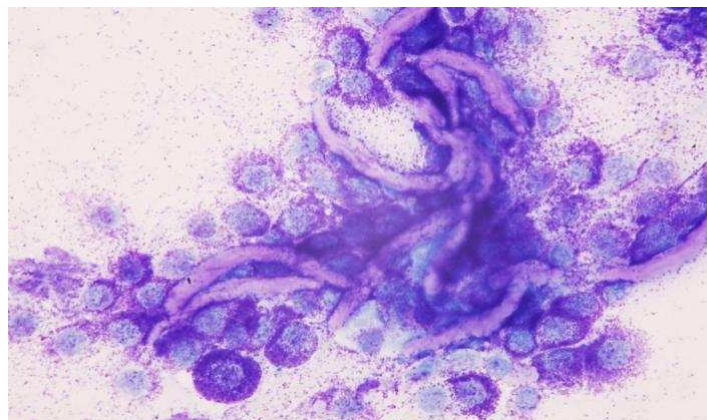
Just "mucus" (0,5 pt)



**6 - Dog, cutaneous mass**

**1. What is the pink material amongst the cells?**

**2. What is this process called?**



**6 - Dog, cutaneous mass**

**1. What is the pink material amongst the cells?**

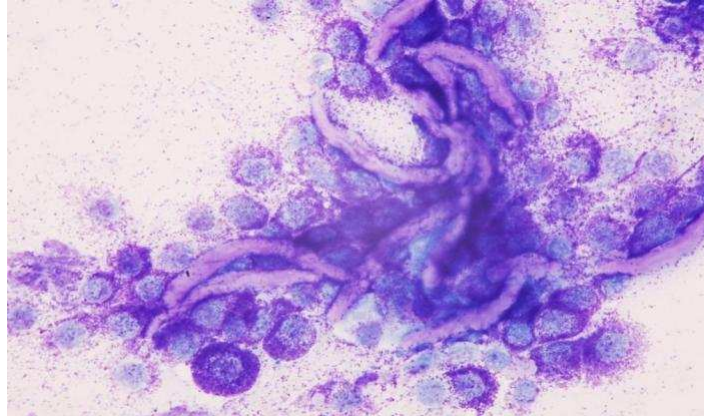
Collagen (1 pt)

**2. What is this process called?**

Keloidal change (1 pt)

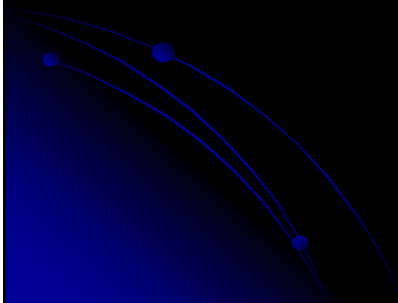
Accepted

"collagenolysis" (1 pt)



## Cytology

Part 3 = 15 glass slides



*ECVCP Examination 2015*  
*Section of Cytology – part 3: Glass slide evaluations*

Candidate number: \_\_\_\_\_

**GS 6 (16 points)**

**History:** A 10 year old Labrador Retriever with a pleural effusion.

**Specimen:** Sediment smears from pleural fluid.

Guide	Description	
0,5	Cellularity and cell preservation	
	high cellularity, good preservation	0,5
	Main population (up to 2.5)	
1	Cell type, size and shape (inflammatory, round, epithelial, spindle, naked nuclei, undifferentiated or mixed)	large pleomorphic undifferentiated cells, round, oval or spindle shaped
0,5	Anisocytosis	marked, some giant multinucleated cells
0,5	Cell arrangements (single or cohesive groups, pallisade, acinar, rows etc.)	individual cells and a few loose aggregates
0,5	Cell borders	distinct
2	Cytoplasm (total up to 2)	
	Cytoplasm amount or N:C	very variable amount, variable N:C
	Cytoplasm colour and staining intensity	lightly to deeply basophilic
	Cytoplasm texture (granular, vacuolated or smooth)	a few to many vacuoles, small and punctate or larger and less well defined

Guide	Description	
2	Nucleus (total up to 2)	
	Location (central or eccentric, basal, polar)	central, paracentral or eccentric
	Number	usually one, up to 6
	Shape	round to oval
	Size including variability	large, marked anisokaryosis
	Moulding	
	Chromatin structure	coarsely granular
	Mitoses	Small numbers, sometimes atypical
2	Nucleolus (total up to 2)	
	Visibility	prominent
	Location	central
	Number	one to four
	Size including variability	medium to large
	Shape	round to oval
up to 3	Other cell populations	
	Cell type and number	red cells, neutrophils, a few macrophages
	Description and size	
	Extracellular material and amount	proteinaceous background with lipid vacuoles
	Additional non-cellular features	
	Infectious agents	
	Interpretation	
2	Most likely diagnosis	Tumour effusion
1	DDX	mesothelioma most likely, sarcoma less likely
	Comments	
	include prognosis, metastatic potential etc.	poor prognosis
	Further tests	
	immunocytochemistry or immunohistochemistry, imaging, search for primary	
2	Quality of answer presentation	
1		
	Total	16

## Agenda: Sunday afternoon

### Clinical biochemistry

MCQ= multiple choice questions  
CC = clinical biochemistry cases

14:00-15:15	(75mn)	Part 1 = 50 MCQ	50%
15:15-15:30	(15mn)	Break	
15:30-17:30	(2h)	Part 2 = 4 CC	50%

## Clinical Biochemistry

Part 1 = 50 multiple choice questions

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 1: Multiple choice questions*

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**MCQ no. 7:**

**Hyperlactatemia can be seen in all the following, EXCEPT:**

- A. Sepsis
- B. Stress
- C. Urea toxicosis
- D. Strenuous exercise

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 1: Multiple choice questions*

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**MCQ no. 7:**

**Hyperlactatemia can be seen in all the following, EXCEPT:**

- A. Sepsis
- B. Stress
- C. Urea toxicosis
- D. Strenuous exercise

Reference: Stockham and Scott, Fund. Vet clin path, 2<sup>nd</sup> ed, p 541



*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 1: Multiple choice questions*

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**MCQ no. 11:**

**Regarding serum biochemical testing in reptiles, which of the following answers is INCORRECT?**

- A. Urea levels are not a reliable indicator of renal disease
- B. Calcium to phosphorous ratio is not a reliable indicator of renal disease
- C. Uric acid elevations are only seen late in the course of renal disease (loss of >70% of renal function)
- D. Female reproductive activity causes a significant hypercalcemia linked to physiologic hyperalbuminemia

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 1: Multiple choice questions*

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**MCQ no. 11:**

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- B. Calcium to phosphorous ratio is not a reliable indicator of renal disease
- C. Uric acid elevations are only seen late in the course of renal disease (loss of >70% of renal function)
- D. Female reproductive activity causes a significant hypercalcemia linked to physiologic hyperalbuminemia

Reference: Fudge. Laboratory medicine of avian and exotic pets. 2000. Page 218-221  
 Correct answer: b. Calcium to phosphorous ratio not a reliable indicator of renal disease

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 1: Multiple choice questions*

**MCQ no. 22:**

Serum data from a 4-year dairy cow with milk fever

	Result	Ref. range
Creatinine (μmol/L)	130	85 - 135
Total Protein (g/L)	81	55 - 85
Albumin (g/L)	34	25 - 35
AST (U/L)	<b>224</b>	< 170
ALP (U/L)	<b>53</b>	150- 350
GGT (U/L)	38	< 45
Glucose (mmol/L)	4.2	3.3-5.8
CK (U/L)	<b>452</b>	< 350
Total calcium (mmol/L)	<b>1.4</b>	2.0 – 2.6
Phosphate (mmol/L)	<b>1.1</b>	1.8-2.3
Magnesium (mmol/L)	<b>0.6</b>	0.7 – 1.0
Sodium (mmol/L)	152	135 -155
Potassium (mmol/L)	<b>3.7</b>	3.8- 5.2
NEFA (mmol/L)	0.5	< 1.0
βOH butyrate (mmol/L)	1.1	< 1.4

What is the most likely diagnosis?

- A. Ketosis
- B. Hepatitis
- C. Insufficient calcium intake in diet
- D. Lack of vitamin D hydroxylation

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**Reference:** Stockham and Scott, Fundamentals of Veterinary Clinical Pathology 2<sup>nd</sup> edition, p. 607

# Clinical Biochemistry

Part 2 = 4 clinical cases

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 2: Clinical case evaluations*

Candidate number: \_\_\_\_\_

**Case 1 – 13 points**

A 7-year-old, entire female Golden Retriever dog was presented with a 2 year history of obesity (38 Kg). The dog had been regularly vaccinated and wormed. Faeces were normal in quantity and consistency. The owner had noticed recent polyuria-polydipsia and exercise intolerance. Water intake was about 3.5 litres/day. The dog was fed with dry diet once a day and was housed in a garden.

On physical examination, the bitch appeared overweight with thickened skin, spacing of the lower teeth, and an enlarged mammary gland.

CHEMISTRY			
Analyte	Result	Reference interval	
AST	85	15 – 80	U/L
ALT	157	15 – 60	U/L
ALP	352	50 - 185	U/L
GGT	8	2 - 15	U/L
Bilirubin (total)	5	2 – 17	µmol/L
Total Proteins	73	57 – 77	g/L
Albumin	28	26 – 38	g/L
Globulin	45	26 – 38	g/L
A/G	0.6	0.8 – 1.1	
Cholesterol	9.8	2 – 5.7	mmol/L
Triglycerides	2.5	0.6 – 1.8	mmol/L
Glucose	7.2	3.3 - 6.1	mmol/L
Lipase	450	100 - 560	U/L
Amylase	830	350 – 900	U/L
Urea	10	2.5 - 8.5	mmol/L
Creatinine	106	62 – 115	µmol/L
Phosphate	0.6	0.8 - 1.8	mmol/L
Sodium	144	144 - 152	mmol/L
Potassium	3.8	4.0 - 5.2	mmol/L
Na/K	38	>27	
Chloride	110	107 – 115	mmol/L
Calcium	2.1	2.2 – 2.8	mmol/L
CK	95	45 - 100	U/L

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 2: Clinical case evaluations*

**URINALYSIS (voided sample)**

<i>Analyte</i>	<i>Result</i>	<i>Reference interval</i>
Specific gravity	1.012	1.015 – 1.070
Color	pale yellow	yellow
Turbidity	clear	clear
PH	6.8	5.5 – 7.5
Protein	1+	Neg – 1+
Glucose	Neg	Neg
Ketone	Neg	Neg
Heme	Neg	Neg
Bilirubin	Neg	Neg
Prot/Crea ratio	0.6	< 0.5
<b>ENDOCRINOLOGY</b>		
Insulin like growth factor1 (IGF1)	423	140 - 290 µg/L

Discuss the blood and urine parameters and briefly explain the pathological findings. What other diagnostic test would be of value in this case? Discuss the indications for these additional tests.

Present the most likely diagnosis in this case considering the clinical symptoms and give some prognostic considerations in that case.

Organized and proper presentation is worth 0.5 point

Correct diagnosis and prognostic factors are worth 2.5 points

Total 13 points

*ECVCP Examination 2015*  
*Section of Clinical Biochemistry – part 2: Clinical case evaluations*

**DISCUSSION CASE 1**

A mild increase in ALP, AST and ALT without increase in  $\gamma$ GT could be induced by a moderate chronic liver injury or various endocrine diseases leading to lipidosis such as diabetes mellitus, hyperadrenocorticism or hypothyroidism.

1.5 pt

Slight increase in globulins with albumin in the lower value of the reference range (low A/G ratio) could be due to inflammation.

1 pt

A microalbuminuria with urea in high reference range, low urine specific gravity without increase in creatinine suggest an arterial hypertension or any inflammatory disease altering the selectivity properties of the glomerular capillary wall.

1 pt

Glycemia just above the reference values without glucosuria could be due to feeding, stress or decrease in insulin insensitivity (or resistance). The most frequent contributor factors of insulin-resistance are obesity, inflammation, hypercorticism, acromegaly and luteal activity

2 pt

Hypercholesterolemia and hypertriglyceridemia could be secondary to obesity and/or endocrine dysfunction

1 pt

Hypocalcemia associated with hypophosphatemia suggests a lack of hydroxylated vitamin D. The cause could be liver injury because of obesity

1 pt

Kaliemia at the bottom of the reference values could be explained by hyperinsulinemia or alkalosis (liver injury due to obesity)

0.5 pt

Increase in IGF-1 could be due to an increase in GH secretion. Increased GH is usually observed in acromegaly (primary or secondary).

1 pt

**Suggestion of additional tests**

1 pt

- Fructosamine to measure the severity and duration of hyperglycemia
- Insulin to appreciate the insulin insensitivity (resistance)
- Cortisol (ACTH stimulation or Low-Dose Dexamethasone suppression test) to put in relief an hyperadrenocorticism and find out a primary cause to obesity
- Thyroxine (total or free) to assess thyroid function and find out a primary cause to obesity (primary hypothyroidism) and hypercholesterolemia.

**Diagnosis**

2 pt

This bitch suffers from an acromegaly subsequent to the heat(?) cycle. During progression of the luteal phase, the progesterone-induced GH production originates from the mammary gland and leads to acromegaly. GH stimulates IGF1 hepatic production and induces insulin insensitivity (or resistance).

GH and insulin resistance worsen the steatosis (lipidosis) inducing a chronic inflammation and hepatic injury. The results of hormones assays (hypercorticism, hypothyroidism and insulin insensitivity) are the prognostic factors to indicate the severity of the disease. Obesity will increase at every cycle if the animal is not spayed.

0.5 pt

Clear and proper presentation

0.5 pt

**Total points**

**13 pts**